Evaluating the response of *Galium* species and populations to herbicides

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Abstract

Canola (*Brassica napus L.*) is one of the most important grain crops in Western Canada. The recent profitability of canola has resulted in tightened crop rotations and increased acres devoted to canola production. *Galium* species, collectively known as cleavers, are highly competitive weeds, which represent the fastest growing weed species in Western Canada. The objectives of this study were to evaluate the efficacy of existing canola herbicides (glufosinate, glyphosate, imidazoline) and potential new herbicides (quinclorac and clomoazone) on *Galium* species. Field experiments were conducted in 2013 at Floral Saskatchewan and Scott Saskatchewan. A separate RCBD was set up for each herbicide tolerant system. In each RCBD 1 canola variety was chosen and seeded at a target density of 85 plants per m-2. Cleavers were planted at a target density of 85 plants per m-2. Variables measured were herbicide control, crop injury, canola biomass, cleaver biomass, canola height and yield. Data was subjected to ANOVA using the mixed model procedure in SAS. Cleaver biomass was the only variable found to be significant in all herbicide systems. All herbicide treatment significantly reduced cleaver biomass compared to the unsprayed check. In the glyphosate tolerant system yield was significant and a combination of preseed clomazone and in-crop glyphosate had the highest yield. In the imidazoline and glufosinate-ammonium system canola biomass was also found to be significant. Plant height was not significant in any of the herbicide systems.

Introduction

Canola (*Brassica napus L.*) is the one of the most widely grown crops in Western Canada. The canola industry contributes approximately $15.4 billion to the Canadian economy each year (Canola Council, 2011). The recent profitability of canola has resulted in tightened crop rotations and increased acres devoted to canola production. Producers planted a record 18.7 million acres in 2011 and 21.2 million acres in 2012 (Canola Council, 2012). Canada accounted for 59% of global canola exports (Stats Can, 2012). Canola is primarily crushed into oil either for human consumption or for a variety of consumer and commercial end products (Canola Council, 2011).

Weeds represent the principal source of yield loss in Western Canada. Canadian farmers spend over 500 million annually on herbicides to control weeds (Croplife Canada, 2003). According to the most recent Prairie weed survey, *Galium* species ranked 9th among weeds for the 2000's. This is an increase of 21 from the 1980's survey (Leeson et al, 2005). The substantial increase in cleavers distribution and frequency can be partially attributed to the increase in canola acres. The correlation between increasing cleavers

populations and canola acres potentially means that current canola herbicide options do not effectively control cleaver populations. Group 2 resistant cleavers are a well-documented problem in Clearfield canola. Research by Stechel et al. (1997) has shown that glufosinate-ammonium has poor efficacy on cleavers. Alternative herbicides such as quinclorac and clomazone have shown some potential to be used with current herbicides but very little research has been done on efficacy. In addition to competing with the crop for light, water and nutrients, *Galium* species have weak, climbing stems, which can cause crop lodging and harvesting problems (Defelice, 2002)

The distribution and density of cleavers in Western Canada is well documented, but information regarding the efficacy of the present herbicide options for cleaver control in canola is insufficient. Very little research has been conducted exploring differences in efficacy among the two primary cleaver populations found in Western Canada. Studies conducted by Malik and Vanden Born (1988) outlined the response of *Galium spurium L* and *Galium aparine L* species to common herbicides in the 1980's, but little follow-up research has been conducted on herbicides currently used in canola production. Dose response trials and field trials that document the effectiveness of the present herbicide options will help farmers make better agronomic decisions when controlling *Galium* populations. Several herbicides, presently not registered for *Galium* control in canola, have the potential to increase control. If found to be effective, new herbicides could be incorporated into canola herbicide regimes to reduce yield loss and increase canola quality.

This project was designed to determine the response of *Galium* species and populations to new and existing herbicides. The study will also evaluate the present status of herbicide resistance and the differences between populations. Data collected will provide the Canadian canola industry with vital information regarding the response of cleavers to current in-crop herbicides as well as potential new herbicides for use in canola production. This should provide growers and agronomists with additional herbicides to manage *Galium* species in canola crops.

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Round Up Ready

Treatment	Yield		Cleaver Bio		Canola Bio	
Clom	1998.8	A	8.985	B	164.74	BC
Check	2024.2	AB	46.44	A	152.1	C
Gly	2480.5	ABC	0.07	B	235.57	AB
Gly + Quin	2557.3	ABC	0	B	273.01	A
Clom + Quin	2611	ABCD	0.52	B	160.88	BC
Gly + Quin + Clom	2635.6	BDC	0	B	190.09	BC
Quin	2770.6	CD	0.023	B	197.51	ABC
Gly + Clom	3202.3	D	0.633	B	240.36	AB

* Different Letters by each mean indicate significant differences between the means at α=0.05

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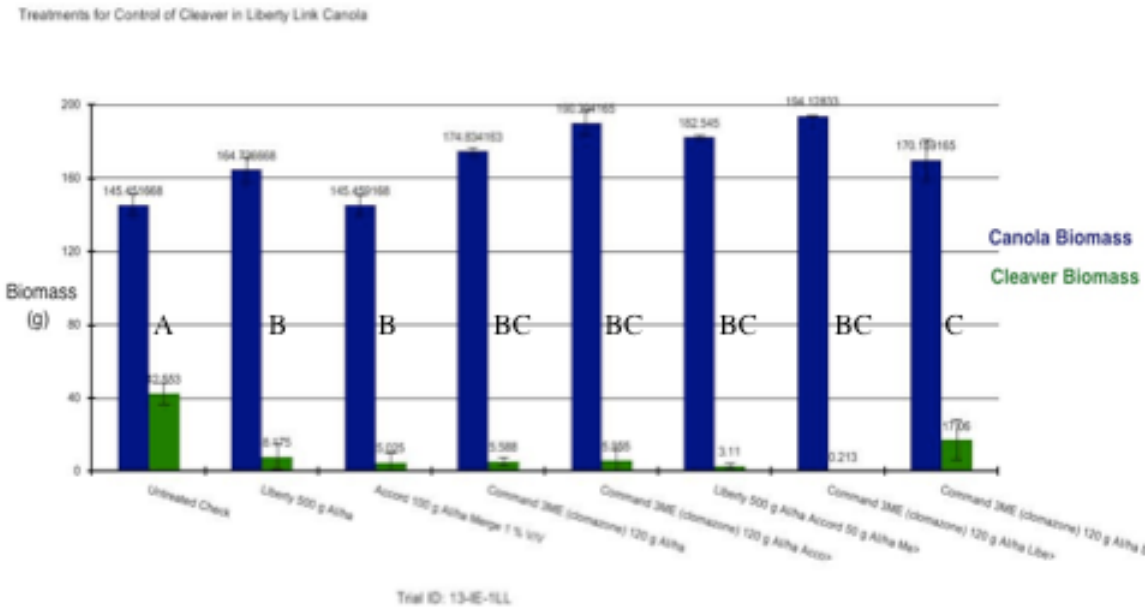
Liberty Link



Clearfield

Treatment	Can Bio		Cle Bio	
Ares	354.99	A	50.44	AB
Ar + Quin + Clom	321.3	AB	3.51	B
Quin	291.38	ABC	4.92	B
Clom + Quin	291.07	ABC	7.39	B
Check	256.46	BC	44.96	AB
Ar + Clom	251.06	BC	60.02	C
Clom	250.75	BC	20.95	AB
Ar + Quin	208.75	C	52.61	AB

* Different Letters by each mean indicate significant differences between the means at α=0.05